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(54) A surgical instrument for arthroscopic arthroplasty

(57) An orthopedic surgical instrument for arthroscopic arthroplasty of the joints of the body, for insertion into the joint through a puncture wound and capable of removing degenerated cartilage and bone over an extended surface area, to a limited depth, to expose blood supply and induce growth of fibrous secondary cartilage to regenerate an articular surface is a rotating, semi-shielded cartilage and bone abrading, suctioning instrument featuring an outer tubular sheath 20 attached to a support and within the sheath, an inner tubular shaft 24; at the distal end of the inner tubular shaft 24, partially shielded by the outer sheath, is an abrading element 44 that is rotated to present an abrading surface. At its proximal end, the inner tubular shaft is connected to a vacuum source for removal of tissue-carrying fluid and bone abraded from the joint surface. This fluid reaches the tubular shaft from the region of the abrading element via an inlet 21 and a passage 72 through an annular distal bearing 90 which supports the inner tubular shaft, the shaft being subject to transverse loading during bone-abrading engagement. Powered means are provided to rotate the inner tubular shaft relative to the outer sheath under bone-abrading load.

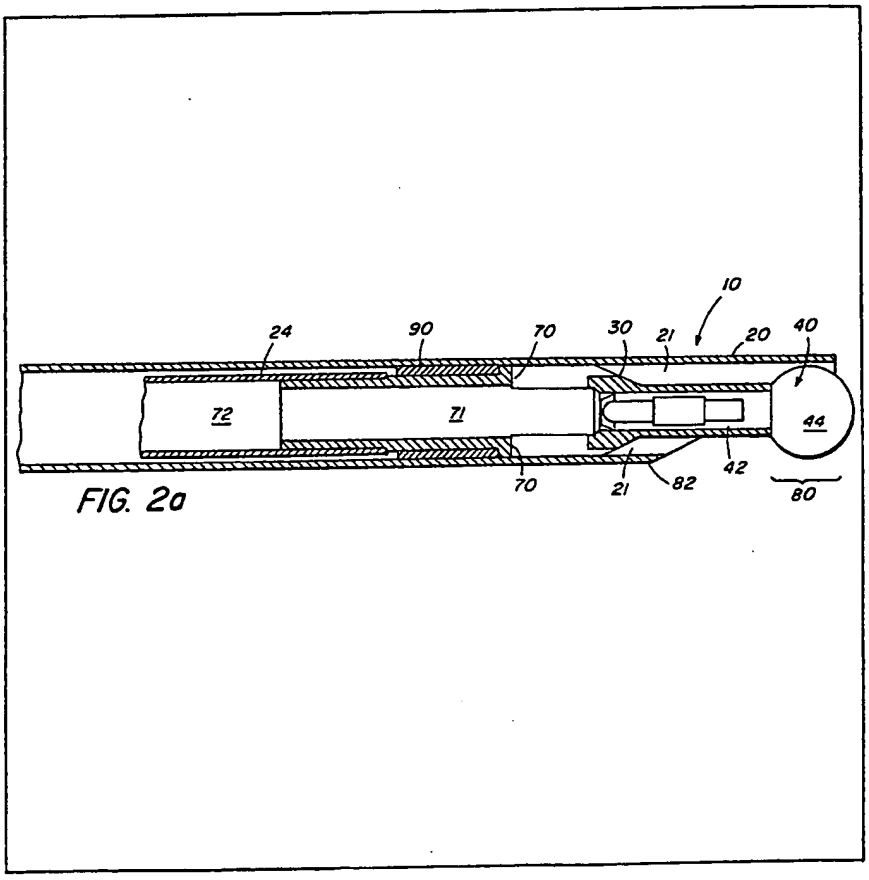

FIG. 2a

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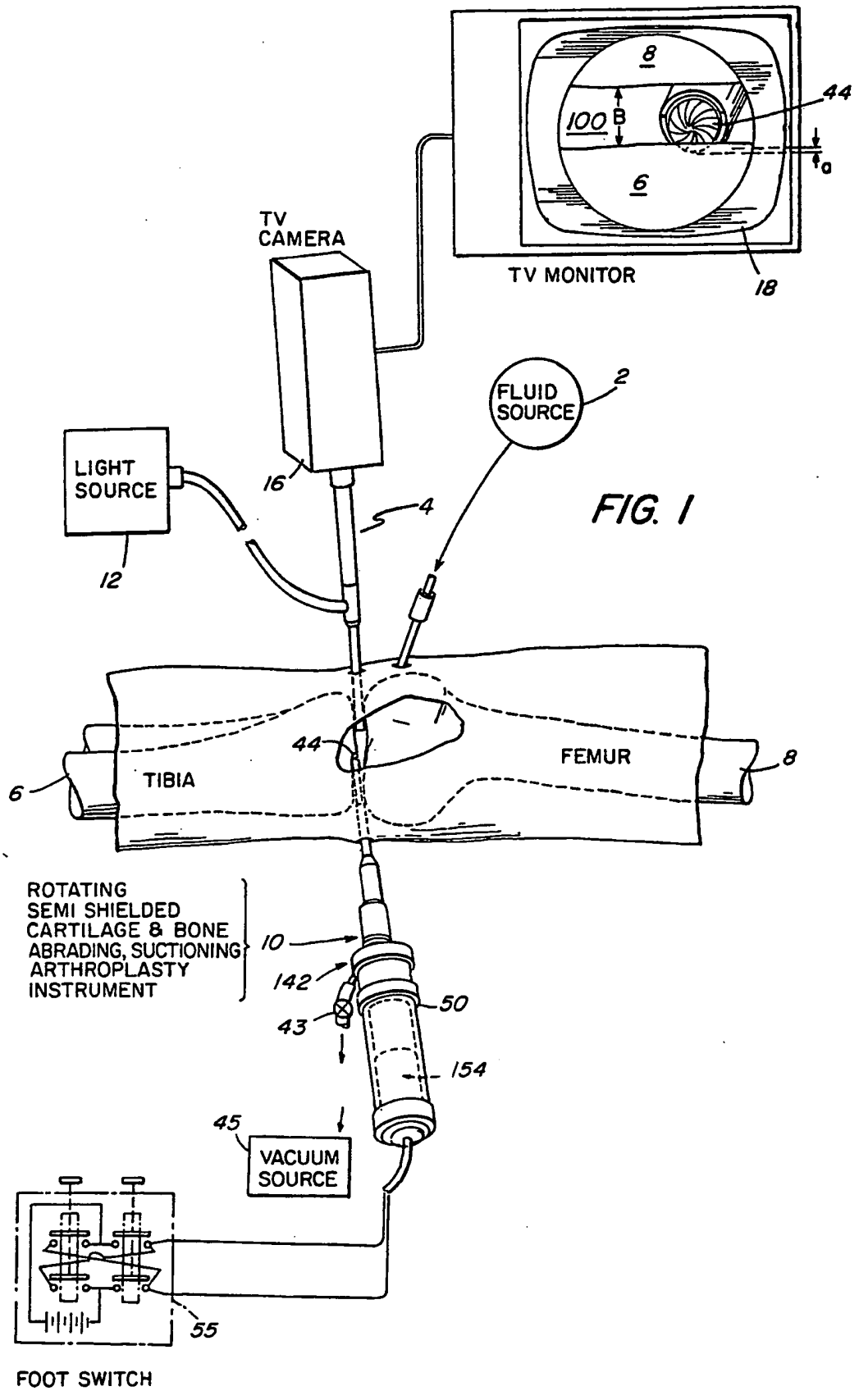

FIG. 1

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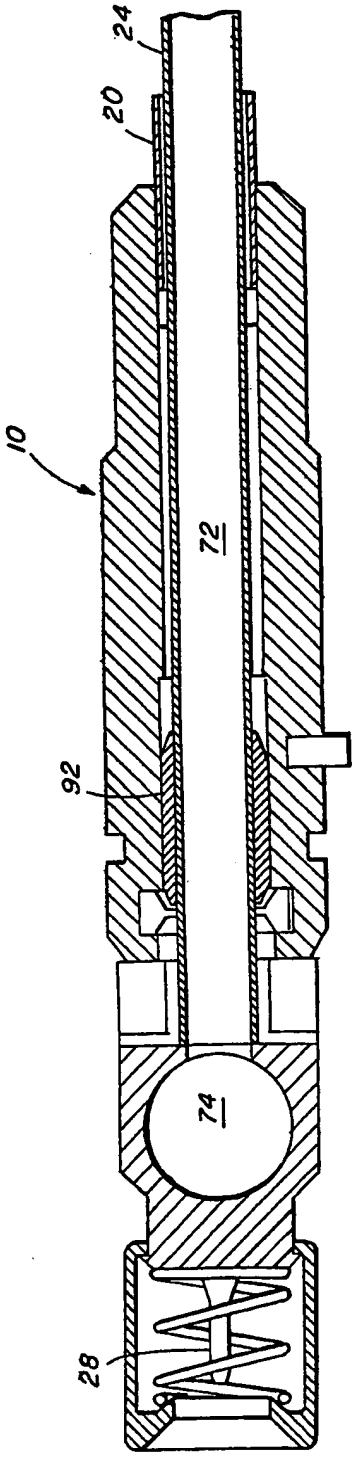

FIG. 2

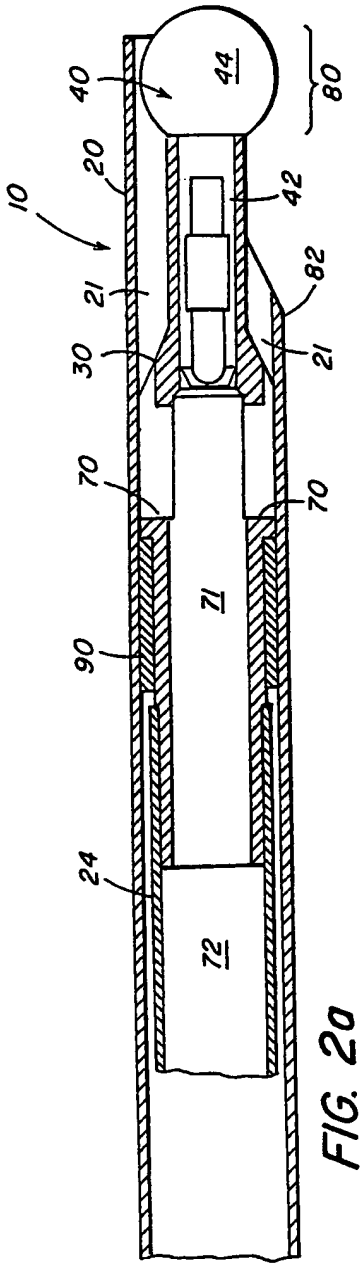

FIG. 2a

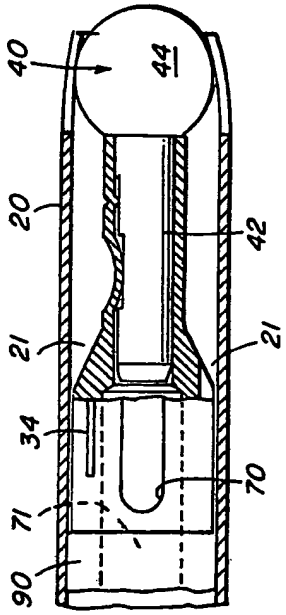

FIG. 3

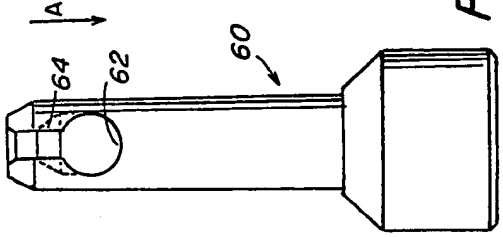

FIG. 9

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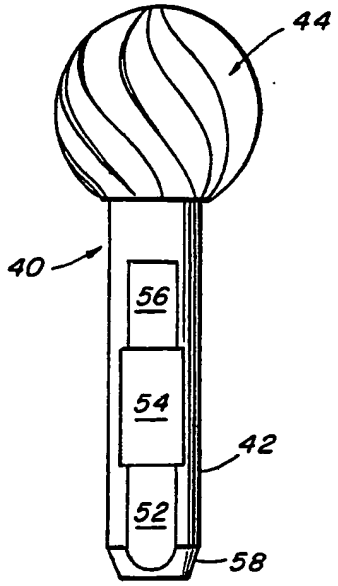

FIG. 6

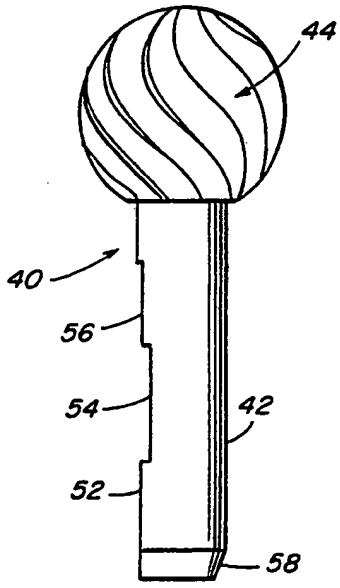

FIG. 7

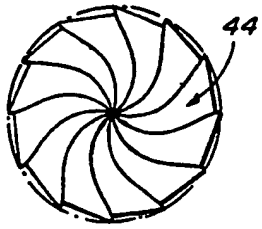

FIG. 8

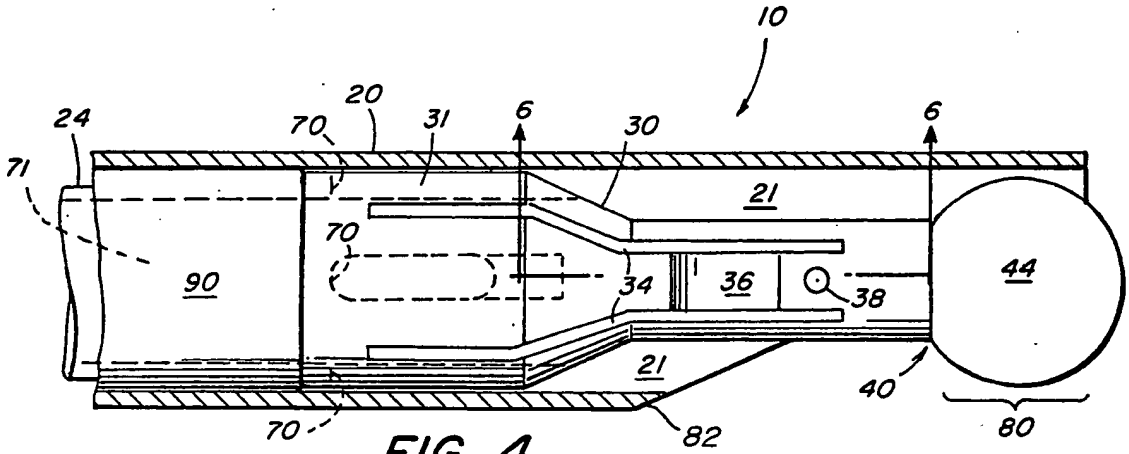

FIG. 4

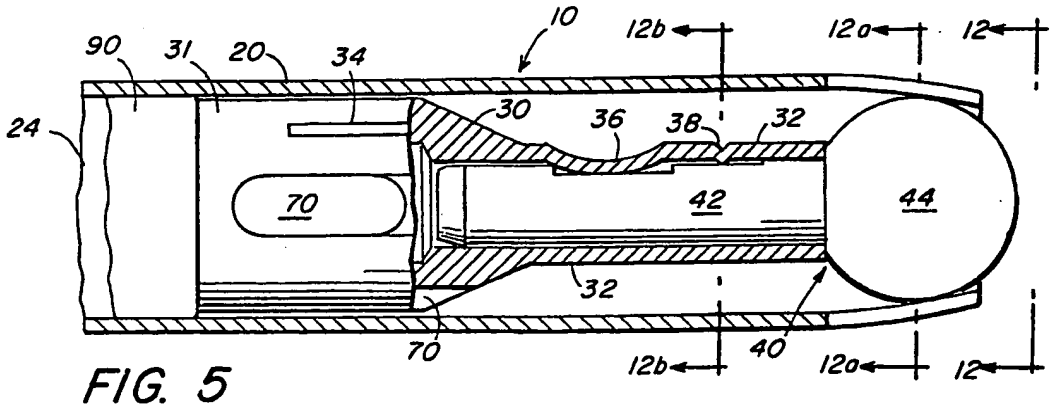

FIG. 5

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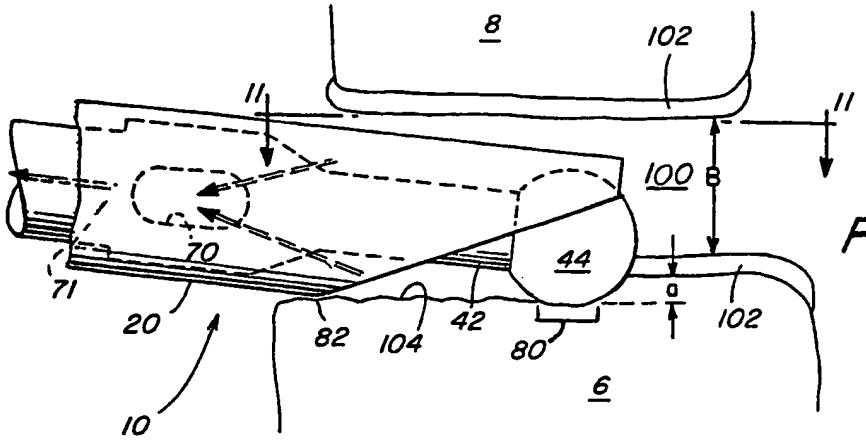

FIG. 10

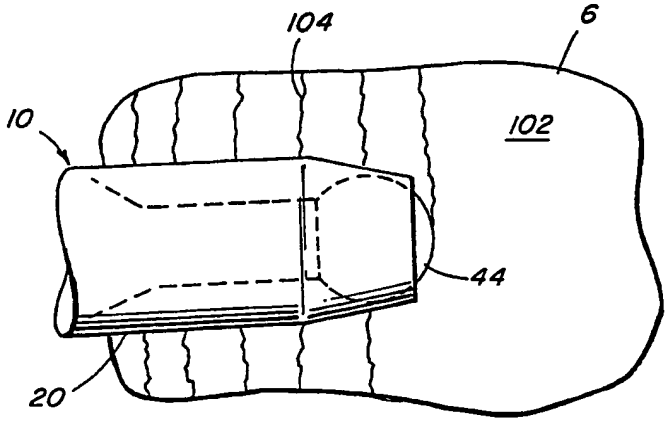

FIG. 11

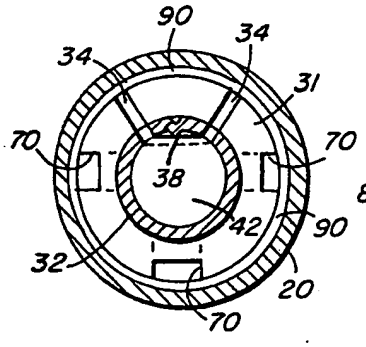

FIG. 12b

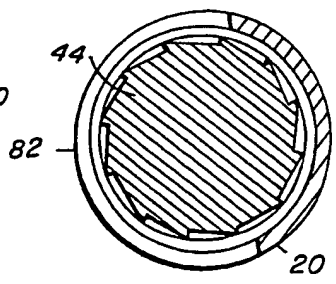

FIG. 12a

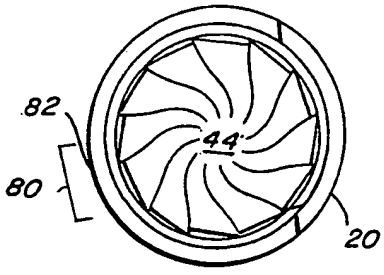

FIG. 12

SPECIFICATION

A surgical instrument for arthroscopic arthroplasty

This invention relates to orthopedic surgical instruments and in particular to instruments capable of performing intra-articular arthroplasty by arthroscopic visualization. The term "intra-articular" refers to joints of the body such as the knee, "arthroplasty" refers to a surgical procedure for the molding or shaping of joint surfaces, and "arthroscopic" refers to viewing by probes inserted into the joint region through punctures, i.e. without surgically laying the joint open.

A. Arthroscopic Surgery

Although it was proven possible decades ago to visualize the joints of a human being by insertion of viewing probes (endoscopes), surgery of the joints has continued to be performed mainly by open surgery. Thus, in a typical knee operation, although the object of the surgery for instance is to remove small amounts of cartilage or bone, a relatively large incision has been required. This takes a considerable time to heal which itself can cause trauma, discomfort, and limitations of movement.

To anyone who might contemplate arthroplasty by closed surgery of the knee or other joint space, numerous restrictive and apparently conflicting requirements are encountered. For instance, the instrument should be small for maneuverability and ability to enter the region of interest of the joint but large in order to transmit the forces and to conduct away the matter to be removed; it should be safe from unwanted action against the joint surface, but capable of sufficiently strong action when desired. And above all, it should be reliable and capable of safe use by orthopedic surgeons of varying skill.

Arthroscopic surgical instruments so-far developed, e.g. the Intra-articular Shaver corresponding to U.S. Patent No. 4,203,444 by Bonnell et al., are highly effective for their intended purpose, but are not applicable to certain arthroplastry procedures such as those requiring removal of bone.

B. Background of Regeneration of Articular Surfaces

In certain instances, e.g. when the thin coating of articular cartilage that acts as a low-friction load bearing surface on the condylar surfaces of the tibia and femur degenerates, e.g., as is the case in degenerative arthritis it has been proposed, at selected spaced apart points, to drill into subchondral bone to a depth, e.g. of 3 or 4 mm, to expose the vascular bed with the hope of encouraging growth of fibro cartilage to regenerate an articular surface.

In other instances curretage has been employed for the same purpose, but often with detrimental alteration of the surface contour.

According to one aspect of the invention, it has been discovered that in lieu of such deep and discrete drilling or severe curretage, a more favorable result is attained by uniformly decorticating, i.e. abrading the articular surface over a general extended area to only a depth of about 0.5 to 1 mm, using a rotating, semi-shielded cartilage and bone abrading, suctioning instrument under direct arthroscopic surgical visualization.

A further aspect of the invention is the provision of such an arthroscopic abrading instrument that enables such arthroplasty under arthroscopic control, with the instrument being sufficiently small to allow maneuverability and accessibility within a restricted joint area while transmitting the forces necessary for the abrading removal of cartilage and bone, and conducting away the matter removed, thus enabling the arthroplasty to be performed via a small puncture wound.

To summarize in greater detail, the invention features a surgical instrument for arthroscopic arthroplasty of the joint, adapted for insertion into a joint via a puncture, and, under the direct visual control of the surgeon via an arthroscope, capable of removing degenerated cartilage and bone of a load-bearing articular surface and exposing the profuse vascularity beneath the surface of the sclerotic bone over a selected area of the surface to enable fibrous growth and healing under the influence of this blood supplied by the vascular bed, thus to enable generation of fibro cartilage to cover the load bearing articular surface.

Specifically, the invention provides a surgical instrument for removing bone at a load-bearing, articular surface of a joint, esp. A knee, of a living being to expose lower-lying bone tissue which has blood supply (is vascular), thereby to enable, under the influence of said blood supply, growth of fibrocartilage that can extend over said articular surface for improving articular function, comprising a rotatory shaft being on its proximal end driven by a motor and having on its distal end an element, capable of progressively removing said bone by gradually reducing the bond to small particles, characterised in that an outer tubular sheath encloses said motor driven shaft and is sized to be inserted from the exterior through a puncture in the flesh of said living being into said joint to the situs of said articular surface and, under visual control via an arthroscope introduced via another puncture in the flesh, adapted to be operated within the joint, said power driven shaft comprises a hollow tubular shaft extending through said outer sheath and carrying at its distal end as said bone removing element an abrading element, having at least a side abrading surface for removing a thin layer of bone over an extended area of said load-bearing articular surface, said outer sheath is configurated to expose a limited portion of said abrading surface, thereby to assist in limiting depth penetration of said abrading element into said articular surface and shielding said abrading element from contact with joint surfaces in other directions, said shaft being rotatably supported relative to said outer sheath

by at least one hollow, annular distal bearing member to enable transverse loading of said abrading element, and having the inner hollow volume of the hollow tubular shaft communicating through the bearing with a fluid opening, located distally of said bearing member and communicating with the region of operation of said abrading element, and being with its proximal end connectable to a vacuum source, thereby enabling fluid with suspended abraded material to be withdrawn from said region of operation through said opening and through said driven tubular shaft.

The invention includes a surgical instrument for arthroscopic surgery by removal of selected portions of bone from a joint, which apparatus comprise a rotary shaft, a tubular member housing the shaft, an abrading tool mounted for rotation at a distal end of the shaft, drive means connected to rotate the shaft and tool, at least one bearing member located adjacent the distal end of the shaft and supporting the shaft for rotation in the housing against side loads, a passageway for fluid from adjacent the distal end of the shaft up through the housing, and means for drawing fluid through said passageway, whereas the abrading tool partially shielded by the housing and is exposed for abrading action at least at a side surface thereof.

In preferred embodiments: spaced apart distal and proximal bearing surfaces are provided, preferably the distal bearing member being an annular surface extending radially and rotatable with the inner tubular shaft; the outer sheath is configured to expose a limited portion of one side of the abrading element, or the outer sheath is configured to expose a limited portion of the end of the abrading element, preferably the sheath is configurated to expose a limited portion of one side and a limited portion of the end of the abrading element for the abrading action the distal portion of the outer tubular sheath is progressively relieved along one side to progressively expose from one side the abrading surface of the abrading element, the distal end of the shaft is terminated proximally of the end surface of the abrading element, and the exposed side of the abrading element is substantially aligned with the tubular wall of the outer sheath, preferably the outer sheath being progressively relieved along a line which lies in a plane disposed at an angle of 30° or less to the axis of the tubular sheath; the instrument is adapted to be connected to an external vacuum source and the internal tubular shaft is capable of removing fluid carrying abraded tissue and bone from the joint at a flow rate of the order of at least 100 cubic centimeters per minute; the abrading element is formed at one end of a drive spur, the drive spur being removably carried axially at the distal end of the inner tubular shaft; the distal end of the inner tubular shaft is a chuck member, the chuck member being hollow and having a receiving means to axially receive and fixably retain the drive spur of the abrading element during engagement with the joint surface, the distal bearing extending annularly from the external wall of the chuck member proximally of the receiving means, and there being a hole through the annular wall of the chuck member, the hole being proximal of the receiving means and distal of the bearing member, the chuck member serving as a conduit for fluid carrying abraded tissue through the distal bearing and the chuck member conduit being connected to the internal tubular shaft conduit to carry the fluid from the body; the inner tubular shaft has a locking means which is adapted to receive the distal end of the abrading element drive spur in a secure relationship that prevents dislodgement of the drive spur during surgical maneuvering, preferably the abrading element and the drive spur being formed as a single unit; the outer tubular sheath is about 50 mm in length or longer and has an outer diameter of the order of 4 mm or larger; and the inner tubular shaft is rotated at a speed of the order of between 500 rpm and 3000 rpm; the rotating means is reversible under the control of the surgeon, with the abrading element adapted to abrade less aggressively in the reversed direction than in the forward direction.

Beyond the specific arthroplasty that has been described, the instrument is found to have use in other cases, e.g. when the cartilage in the joint has a surface defect or an irregular surface, or even during other intra-articular surgery when irregularities are formed in the cartilage. The instrument can be effective to smooth and shape surface defects and irregularities to reduce the pain felt by the patient and improve the patient's joint mobility.

In a totally different context, i.e. for removing objects from the body, especially objects in the eye, e.g. lenses with cataracts, an abrasive cutting instrument with an adjustable tubular means to control the exposure of the abrasive cutting tip is shown in Banko U.S. Patent No. 3,937,222.

The structure and operation of a preferred embodiment of the invention will now be described with reference to the drawings, in which:—

Fig. 1 is a diagrammatic view showing the set-up of the instrument according to the invention with accessories for performing intra-articular arthroplasty of the knee;

Fig. 2 is a longitudinal cross-sectional view partially broken away of the proximal end of the instrument of the preferred embodiment, Fig. 2a is a somewhat more enlarged view of the distal end, while Fig. 3 is a similar view of the extreme distal portion of the instrument turned 90°;

Fig. 4 is a longitudinal cross-sectional view of the instrument on an enlarged scale showing the chuck member, while Fig. 5 is a similar view of the chuck member turned 90°;

Fig. 6 is a side view of an abrading element according to the invention, Fig. 7 is a similar view turned 90°, while Fig. 8 is an end viewing showing the helical, fluted abrading surface of the element;

Fig. 9 is a side view of the tool for removing the

abrading member of the invention;

Fig. 10 is a diagrammatic view of the intra-articular surface of a joint undergoing arthroplasty of the vascular bed by an instrument according to the invention;

Fig. 11 is a top view at 11—11 of Fig. 10; and

Figs. 12, 12a, and 12b are end views of the top of the instrument taken at 12—12, 12a—12a, and 12b—12b of Fig. 4.

Structure of the Instrument

Referring now to the figures, in Figs. 1 and 2 the instrument 10 is shown inserted into the joint of the knee to act on the low-friction load bearing condylar surfaces of the tibia 6 and the femur 8. At the same time, a fiber optic cisualisation instrument 4 introduces light to the interior of the joint from light source 12 and returns a visual image along a separate optical path. While the image can be directed to an eye piece for the surgeon, as well as to recording cameras, in the preferred embodiment shown, the image is directed to television camera 16 which creates the display 18, which the surgeon watches to control his movements. By thus watching the screen and manipulating the instrument, the instrument is caused to move across the joint, abrading the surface which is shown in the TV picture. A more detailed view of this is shown in Figs. 10 and 11 which will be discussed below.

During the operation, the joint is distended by providing saline fluid under controlled hydrostatic pressure from source 2.

The success of the instrument is dependent upon the important aspects of its construction as have been noted previously. Referring to Figs. 2, 2a and 3, the instrument 10 of the preferred embodiment comprises an external tube 20, here tubing having an outer diameter of 7.5 mm and an inner diameter of 6.4 mm, and telescopically inserted into the external tube is an internal tube 24, here having an outer diameter of 5.2 mm and an inner diameter of 4.4 mm. The inner tube 24 is rotated relative to the outer tube 20 by a drive train Fig. 1, including a battery driven motor/54 in handle 50 acting on drive tang 28, Fig. 2. The motor is reversible, under the control of the surgeon, e.g. via a foot switch 55. The motor is adapted to produce torque values of the order of 2880 cm gms, and to rotate the abrading element under normal bone-abrading load at speed of the order of 500 rpm, up to about 3,000 rpm.

Referring to Figs. 2a, 3, 4 and 5, fixed at the distal end of the inner tube is chuck 30, here a separately formed unit fixed axially on the inner tube 24 by use of an epoxy adhesive. The chuck 30 is formed to receive and hold the drive spur 42 of an abrading element 40 positively against the forces inherent during engagement of the instrument on the surface of a joint. To meet this purpose, the wall 32 of the chuck 30, of heat treated stainless steel, is cut along the axis at 34 and permanently formed into a leaf-spring-like detent 36. The wall 32 is also deformed at 38 to form an alignment guide. The abrading element 40 is comprised of abrading head 44, here with a diameter of 5.5 mm having an abrading surface with 12 helically fluted edges, on drive spur 42, here having diameter 2.4 mm and length 10.3 mm. The helical edges are so arranged that the abrading element cuts more aggressively in the forward than in the reverse direction of rotation. The head 44 and the spur 42 are machined from a single piece of heat treated stainless steel to reduce the potential of separation under the forces experienced during surgery, e.g. transverse displacement pressure of the order of 170 to 340 kg/cm^2. (This abrading element is also disposable so a new sharp tool may be used for every procedure.) The drive spur is relieved axially, these relieved areas comprising alignment flat 52, detent flat 54 and clearance for the alignment guide 56. The spur 42 is also relieved annularly at 58 at the proximal end to facilitate insertion into the chuck. To prepare the instrument, the drive spur 42 is inserted lightly into the end of chuck 30 and the abrading element 40 is rotated slowly until alignment guide 38 is aligned with alignment flat 52, which is signaled by the drive spur 42 moving further into the chuck 30. The abrading element 40 is then pushed axially into the chuck until detent 36 is in place in detent flat 54 indicated by the engagement of the shoulder of chuck 30 with the mating shoulder on abrading element 40. In this position, abrading head 44 is fixed on internal shaft 24 against all forces experienced during joint surgery. To remove the abrading element 40, it is necessary to use tool 60 shown in Fig. 9. Abrading head 44 is passed through opening 62 while opening 64 engages around chuck 30. Force is then exerted along the axis of the instrument as indicated by the arrow A to withdraw the drive spur 42 from the chuck 30. The abrading element may then be discarded and a new element inserted. The inner tube 24 and the outer tube 20 would usually be disassembled to facilitate this procedure.

When assembled, the abrading head 44 extends axially beyond the distal end of the outer tube 20 by a distance of approximately one millimeter, the outer tube typically being at least 50 mm long. The distal portion of outer tube 20 is also progressively relieved along one side at an angle to the axis of the tube, here at an angle of 24°, to progressively expose the side surface 80 of the abrading head 44 at a position aligned with this external wall 82. This progressive taper is shown in cross-sectional Figs. 12 through 12b.

Because of the forces exerted on the abrading element 44 at an angle essentially perpendicular to the drive axis, it is necessary that the inner shaft 24 be supported against radial deflection under bone-abrading loads. This support is provided by distal annular bearing 90 which is fixed to the external wall 31 of chuck 30 at a point close to the distal end of outer tube 20; and by proximal annular bearing 92 fixed on the wall of inner shaft 24. Both bearings rotate with inner shaft 24, supporting the shaft against the interior wall of external tube 20. Also it is found that by providing

the bearings as described, the frictional drag of the instrument is low, permitting the desired amount of torque to be delivered to the abrading element (approximately 2880 cm gms). This torque is limited purposefully to avoid any unsafe overload condition.

Located proximally of the drive spur detent 36 in the wall of the chuck 30 are holes 70 which connect to a conduit formed by the hollow chuck 30 through distal bearing 90 to the inner shaft 24 and thereby to the vacuum source 45 to remove all the abraded tissue from the joint. The vacuum source 45 is external of the instrument, generally provided as "wall vacuum" in a surgical suite typically of a value of 14—16 in Hg; the level of vacuum at the instrument is controlled by means of valve 43.

In another embodiment of the same construction, the external tube 20 has an outer diameter of 5.7 mm and an inner diameter of 4.7 mm and telescopically inserted into this tube in an internal tube 24 having an outer diameter of 4.2 mm and an inner diameter of 3.8 mm and the abrading element has a diameter of 4.0 mm.

Operation of the Instrument

During the operative procedure as shown in Fig. 1, the patient may be given general anesthesia and appropriate punctures of the patient's flesh are made at selected points about the joint by a trocarring cannula. Liquid is introduced from source 2 into one cannula at a slightly increased pressure to inflate the joint, and to provide flow through the joint to the suction port 70 of the instrument 10. This substantial volume of flow, in excess of 100 cc per minute, is necessary to ensure that all the material abraded from the joint is drawn into the instrument 10 and removed from the joint; it also keeps the joint fluid clear for better visual guidance of the instrument.

Visualization instrument 4 is inserted into the joint through another cannula. The instrument 10 of Fig. 2 is inserted into a third cannula.

The fluid in the joint cavity, as supplied by fluid source 2, is drawn across the abrading element into the annular cavity 21 between chuck 30 and the distal portion of external tube 20 and from there through openings 70 in the wall of chuck 30. The internal cavity 71 of chuck 30 carries the fluid through distal bearing 90 and into the conduit 72 formed by internal tube 24 which passes through proximal bearing 92 to discharge at sluff chamber 74 which, in turn, is connected within housing 42 to vacuum source 45. The relieved configuration of sluff chamber 74 allows suction to be continuously maintained during rotation of abrading element 40.

The surgeon inserts the instrument into the joint with the motor stopped. The fluid source 20 and the vacuum source 45 are balanced so the volume introduced into the joint is the same volume removed through the instrument, with the inflow maintained at slightly higher pressure to appropriately distend the joint.

(The flow passages and operative parts of the instrument are cooperatively constructed for optimal action when the instrument is connected to a source of suction of 14 to 16 in Hg.)

The instrument is inserted (Fig. 10) into the narrow cavity 100 (B being of the order of 8 mm) between the condylar surfaces of the tibia 6 and femur 8 to act on the thin layer 102 of cartilage and the below-lying condylar bone. Though shown abrading a thin layer of cartilage and a limited depth dimension of bone in one pass, the instrument can be controlled to abrade even less tissue during a single pass, using the heel 82 of the outer tube 20 as a control fulcrum. While limited portion of one side and end of the abrading head 44 are exposed by the tapered end of outer tube 20 to contact the condylar surface 102, the side and rear portions of the abrading surface are shielded by the outer tube from inadvertent contact with the surrounding joint tissue.

In this manner, where the load bearing cartilage 102 of the joint has degenerated, the rotating semi-shielded cartilage and bone abrading head 44 of the suctioning instrument is moved across the surface of the joint to remove uniformly the thin covering layer of articular cartilage and a thin layer of bone (the subchondryl bone is removed to a depth of about 0.5 to 1.0 mm) at the focus, i.e. the localized area of disease. This is done in a manner to provide a smooth surface 104, with the vascular bed generally exposed, which allows uniform generation of fibro cartilage over the joint surface.

Other Embodiments

Other embodiments of the invention are within the following claims. For example, oval, cylindrical or other diameter or shaped abrading elements may be used according to the invention, and other abrading surfaces, even a relatively smooth surface, may be employed for the abrading element.

The instrument of the invention may also be employed for other surgical procedures for arthroplasty, e.g. for smoothing defects or irregularities on other cartilaginous surfaces.

CLAIMS

1. A surgical instrumcnt for removing bone at a load-bearing, articular surface of a joint, esp. a knee, of a living being to expose lower-lying bone tissue which has blood supply (is vascular), thereby to enable, under the influence of said blood supply, growth of fibrocartilage that can extend over said articular surface for improving articular function, comprising a rotary shaft being on its proximal end driven by a motor and having on its distal end an element, capable of progressively removing said bone by gradually reducing the bond to small particles, characterized in that an outer tubular sheath encloses said motor driven shaft and is sized to be inserted from the exterior through a puncture in the flesh of said living being into said joint to the situs of said articular surface and, under visual control via an arthroscope introduced via another puncture in

the flesh, adapted to be operated within the joint, said power driven shaft comprises a hollow tubular shaft extending through said outer sheath and carrying at its distal end as said bone removing element an abrading element, having at least a side abrading surface for removing a thin layer of bone over an extended area of said load-bearing articular surface, said outer sheath is configured to expose a limited portion of said abrading surface, thereby to assist in limiting depth penetration of said abrading element into said articular surface and shielding said abrading element from contact with joint surfaces in other directions, said shaft being rotatably supported relative to said outer sheath by at least one hollow, annular distal bearing member to enable transverse loading of said abrading element, and having the inner hollow volume of the hollow tubular shaft communicating through the bearing with a fluid opening, located distally of said bearing member and communicating with the region of operation of said abrading element, and being with its proximal end connectable to a vacuum source, thereby enabling fluid with suspended abraded material to be withdrawn from said region of operation through said opening and through said driven tubular shaft.

2. The surgical instrument of claim 1 characterized in that said inner tubular shaft is supported by spaced apart distal and proximal bearing surfaces.

3. The surgical instrument of claim 1 or 2 characterized in that a said bearing member is an annular surface extending radially and rotable with the surface of said inner tubular shaft.

4. The surgical instrument of claim 1 characterized in that the distal portion of said outer tubular sheath is progressively relieved along one side to progressively expose from one side the abrading surface of said abrading element, the distal end of said outer tubular sheath is terminated proximally of the end surface of said abrading element, the exposed side of said abrading element being substantially aligned with the tubular wall of said outer sheath.

5. The surgical instrument of claim 4 characterized in that said outer sheath is progressively relieved along a line which lies in a plane disposed at an angle of 30° or less to the axis of said tubular sheath.

6. The surgical instrument of claim 1 characterized in that said instrument is adapted to be connected to an external vacuum source and said internal tubular shaft is capable of removing fluid carrying abraded tissue and bone from said joint at a flow rate of the order of at least 100 cubic centimeters per minute.

7. The surgical instrument of claim 1 characterized in that said abrading element is formed at one end of a drive spur, said drive spur removably carried axially at the distal end of said inner tubular shaft.

8. The surgical instrument of claim 7 characterized in that the distal end of said inner tubular shaft is a chuck member, said chuck member being hollow, and said chuck member having receiving means to axially receive, and fixably retain the drive spur of said abrading element during engagement with said joint surface; said distal bearing extending annularly from the external wall of said chuck member proximally of said receiving means; and an opening through the annular wall of said chuck member, said opening located proximally of said receiving means and distally of said bearing member, and said chuck member acting as a conduit for fluid carrying abraded tissue from said opening through said distal bearing, and said chuck member conduit connected to said internal tubular shaft conduit to carry said fluid from the body.

9. The surgical instrument of claim 8 characterized in that said inner tubular shaft has locking means, said locking means adapted to receive the distal end of said abrading element drive spur in a secure relationship, said relationship preventing dislodgement of said drive spur during surgical maneuvering.

10. The surgical instrument of claim 8 characterized in that said abrading element and said drive spur are formed as a single unit.

11. The surgical instrument of claim 1 characterized in that said outer tubular sheath is of about 50 mm length or longer, and said outer diameter of said outer sheath is of the order of 4 mm or larger.

12. The surgical instrument of claim 1 characterized in that said means to rotate said inner tubular shaft is adapted to rotate said shaft at a speed of the order of between 500 rpm to 3000 rpm under normal bone-abrading load.

13. The surgical instrument of claim 1 characterized in that said means to rotate said inner tubular shaft is reversible under the control of the surgeon, said abrading element adapted to abrade less aggressively in the reverse direction than in the forward direction.

14. The surgical instrument of claim 1 characterized in that said outer sheath is configured to expose a limited portion of one side of the abrading element for said abrading action.

15. The surgical instrument of claim 1 or claim 14 characterized in that said outer sheath is configured to expose a limited portion of the end of the abrading element for said abrading action.

16. A surgical instrument for arthroscopic surgery removal of selected portions of bone from a joint, which apparatus comprise a rotary shaft, a tubular member housing the shaft, an abrading tool mounted for rotation at a distal end of the shaft, drive means connected to rotate the shaft and tool, at least one bearing member located adjacent the distal end of the shaft and supporting the shaft for rotation in the housing against side loads, a passageway for fluid from adjacent the distal end of the shaft up through the housing, and

means for drawing fluid through said passageway, whereas the abrading tool partially shielded by the housing and is exposed for abrading action at least at a side surface thereof.

17. A surgical instrument substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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